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Faculty of Graduate Studies

# Epidemiological Study of Intestinal Parasites in Pre-school Children in Al-Jiftlik Area – Jordan Valley

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Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Environmental Sciences, Faculty of Graduate Studies, At An-Najah National University, Nablus, Palestine.

May 2000

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TO

MY DEAR PARENTS,

BROTHERS, AND SISTERS

WITH LOVE AND RESPECT

## Acknowledgments

I would like to express my sincere special thanks and gratitude to my supervisor Professor Mohammed S. Ali- Shtayeh and my co-supervisor Dr. Tamer Essawi for their supervision, encouragement, guidance and help throughout this study.

I also like to express my gratitude and thanks to the President of Medical Relief Committees Dr. Moustafa Barghouthi and the director of labs Mr. Haidar Abu Goush for their support, encouragement and allowing me to use (MRC) facilities.

Thanks are also due to medical staff in Al- jiftlik clinic for their help during the course of study and to Mr. Omar Mansour for his help in clinical diagnosis and sampling.

Also special thanks to my friends, colleagues in the (MRC), specially Mr. Atef Shubeata and Abeer Al-Dalou for allowing me to use their computer facilities.

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## Abstract

An epidemiological study of the prevalence of intestinal parasites and their effect on the hemoglobin level in pre-school children (<6 years old), was carried out during the period December 1998-February 1999 in Al Jiftlik area-Jordan valley.

220 pre-school children were included in the study116 (52.7%) males and 104 (47.3%) females. The findings were discussed in relation to children's socioeconomic, hygienic background and environmental conditions in the study area. (100) (45.5%) of the pre-school children were infected at least with one type of intestinal parasites. Prevalence rates of encountered parasites in the infected population were as follows Giardia *Lamblia* 20%, *Entamoeba histolytica* 14.5%, double infection (*Giardia and Amoeba*) 6.4%, *Hymenolepis nana* 1.8%, *Enterobius vermicularis*, 1.8% and other types 0.9%.

The prevalence rate of intestinal parasitic infection was lower in younger children (< 4years) old (41.2%), than in older children (5-6 years) (54.2%), $P<0.05$. In the infected cases, males (48) (41.4%) were less affected than females (52) (50%). Higher

prevalence rates of parasitic infections among children were also found to be associated with families with lower income (e.g. farmers) or lower education level, than with families with higher income or higher education levels, and families with larger family size.

Higher prevalence of intestinal parasitic infections among pre-school children of Al-Jiftlik, may be partly attributed to wastewater irrigation in the study area, and contamination of food, soil and water environment, health conditions and poor infrastructure in this area.

High prevalence of anemia (42.26%) was found among children in this study area. However, weak association was found between anemia and the prevalence of intestinal parasites. Further work is therefore, still needed to determine the prevalence of carrier state of intestinal parasitic infection in school children in Palestine and to assess its significance in the spread of infection and identify factors that affect this state.

# Chapter One

# Introduction

## 1.1 Distribution and prevalence of intestinal parasites

Intestinal parasitic infections are important public health problems throughout many parts of the world especially in developing countries (WHO, 1981a; 1988; 1992). The public health importance of these parasites continues because of their high prevalence, and their virtually global distribution (WHO, 1987 ). It was estimated that 60% of the world's population in 1998 were infected with intestinal parasites, (Gagandeep *et al.*, 1998). The most common parasitic infections reported globally in 1987 were caused by *Ascaris* 20%, *hookworm* 18%, *Trichuris trichiura* 10%, and *Entamoeba histolytica* 10% (WHO, 1992).

Considerable variations in the global prevalence and intensity of human intestinal protozoan and helminthic infections have been attributed to differences in geographic and climatic factors, human activities, and socioeconomic status (WHO, 1981a).

Intestinal parasites have received a great deal of attention in last two decades (WHO, 1985, 1987; Arne &Akaboug,1986). However, little information about their prevalence is available in Palestine ( Kaspari & Gondie, 1986 ;Union of Palestinian Relief Committees & Birzeit University,1988; Ali-Shtayeh *etal.,*1989). The most common parasitic infections in the West Bank are amoebiasis and giardiasis (Ali-Shtayeh *et al.,* 1989), which are known to be transmitted by oral- fecal route via contaminated water or food (Knight, 1980;WHO, 1981a; Omar *et al.,* 1991).

**1.2 Conditions promoting intestinal parasitic infection**

It is known that infections with intestinal parasites persist and flourish wherever poverty, inadequate sanitation, insufficient health care, overcrowding, and lack of clean water to maintain personal hygiene, prevail (Melvin & Mata, 1971WHO, 1986; 1992; 1993). Many investigations in North America, Europe and elsewhere have shown that the populations of closed rural communities are prone to have high prevalence of intestinal parasites (Jeffery, 1960; WHO, 1981a; Mustafa *et al.,* 1988; Omar *et al.*, 1991).

A fairly stable level of endemicity of many protozoan intestinal infections has shown to be a result of dynamic process based on repeated reinfection (WHO, 1981). The frequency of reinfection depends mainly on two factors, the infection pressure (number of exposures per host in a certain area within a given time), and host susceptibility in which immunological mechanism plays the most important role (WHO 1981a).

The factors influencing the infection pressure of parasitic infection may be divided into two groups: environmental and socioeconomic (WHO,1981a). There is obviously no clear-cut distinction between the two groups because the environment influences the socioeconomic status of people and human activities may change the environment (WHO,1981a). Environmental factors are responsible for the development and spread of parasitic invasive stages, whereas socioeconomic factors are responsible for contamination of the environment with parasites by reestablishing contacts with the parasitic invasive stages (Ilardi *et al.*, 1987).

### 1.3 Etiology and source of infection

The etiology of intestinal parasitic infections vary from one place to another, largely because of different living habits and climatic conditions (WHO,1981a). Some species are widely distributed (e.g., *E. histolytica and G. lamblia)* and others are geographically restricted (e.g. *A. lumbricoides, T. trichiura,* and *Strongyloids*) (Fechman *et al.,* 1983). This could be due to many factors dealing with the infection such as personal hygiene, nutritional status, environmental factors and the nature of the infectious stage (Utzinger *et al.,*1999). The prevalence of these species can also change within many particular region over aperiod of time depending on the source of infection (Powlowski et al., 1991)

Although there is very little clear epidemiological data on the routes of infection by intestinal parasites (WHO,1992), millions of people in the tropics and subtropics live in inadequate housing without proper water supplies or sanitation. Waterborne infections such as amoebiasis (caused by *E. histolytica*) and giardiasis (caused by *G. lamblia*) are common because of the absence of safe–drinking water and the primitive conditions of food storage and handling which result in frequent fecal contamination of foods with intestinal parasites. Thus the frequency of intestinal parasitic infection in human populations has been considered as a general indicator of the local level of development (WHO,1992).

Most common and important intestinal protozoan infections of human in developing countries are *E. histolytica* and *G. lamblia* (WHO,1992). The prevalence of these parasites is generally higher among very young children and this may be related to more efficient fecal–oral route of transmission of the infective stage or enhanced susceptibility due to lack of immunity (John *et al.*, 1998). These parasites are typically endemic with transmission occurring all year-round, perhaps with seasonal fluctuations related to temperature and rainfall (Ali-Shtayeh *et al.*, 1989). Contaminated water or food serving as source of infection (WHO, 1981a;1983; Omar *et al.*, 1991) for males and females ,in both young and adult populations ( Oyerinde *et al.*,1977; Siddiqui., 1981).

## 1.4 Effects of intestinal parasitic infection on children health

There is now evidence that parasitic infection can cause both acute and persistent diarrhea as well as nutrient malabsorption (WHO, 1981b) and that it may be responsible for growth and development retardment in children (Roche & Benito, 1999). Hence, one of the principle factors contributing to child morbidity and mortality in tropical and subtropical countries is the high frequency of diarrheal episodes due to intestinal infection which also contributes to childhood growth retardation (Richard *et al* 1998).

Malnutrition was found to be more prevalent in the older children with higher rates of intestinal parasites than adults (Gupta, 1980; WHO,1981b; Richard *etal.*,1998, ). Hence, the relationship between malnutrition and intestinal parasitic infections has been well established (WHO,1981b), although investigators have reached various conclusions regarding age groups at greatest risk and the effect of parasitic infection especially helminthes infection on growth of children based on weight or height (Egger *et al.*, 1990; Walker *et al.*, 1992).

The intensity and type of parasitic infection contribute to its effect on nutrition, unlike most bacterial and viral gastroenteritis. Hence, intestinal parasitic infections tend to be chronic, and therefore, any deleterious effect of intestinal parasites on the nutritional status of the host may be prolonged (Richard *et al.*, 1998).

Malnutrition and parasitic infections that affect development and school performance could impact the post childhood period by altering academic and occupational prospect (Richard *et al.*, 1999). The nutritional status of children, especially infant, is known to affect the risk of contracting a variety of other infections (WHO,1981b), including intestinal parasitic infection. Malnutrition is thought to cause the depression of the immune response against a number of intestinal parasites. The prevalence of intestinal parasites was found to be 40% in normal infants while it ranged from 47% - 50% in mild to moderate, and 67% in severely under-nourished children. (WHO,1981b)

The association of parasitic infection with lowered Hb levels was reported by several researchers who demonstrated an association between hemoglobin level and parasitism (Arekuls, 1979;Weigl *et al.,* 1996; Brooker *etal.,*1999). In many developing countries children are infected with several different parasites which may cause iron deficiency anemia (Ramdath *et al.,* 1994) since it has been reported that the parasite has a high iron requirement for growth (Diamond *et al.,* 1978). Enteric blood losses is a common characteristic of acute amoebiasis which is associated with parasite phagocytosis of host erythrocytes as well as lysis of intestinal mucosal cells (Sepulveda & Martines 1984; Ravidin & Petri, 1990), and the amount of lost blood has been directly related to the intensity of infection.

The effect of hookworm infection on anemia is well documented (Adedoyin *et al.*, 1990; Sherchand *et al.,* 1996). The most serious consequence of hookworm infection is chronic blood loss from the small intestine leading to the development of iron deficiency anemia (Arekul, 1979). Although there is no doubt that hookworm infection is an important cause of anemia in school–age and adult population (Powlowski *et. al.,* 1991), the contribution of hookworm infection to the etiology and severity of anemia in pre –school children remains ill- defined.

## 1.5 Objectives

The present work was aimed at (a) obtaining adequate data on the prevalence of intestinal parasites in pre-school children in Al-Jiftlik area (an area representing rural human population communities inhabiting the Jordan Valley), (b) studying the effect of family size, socioeconomic conditions and some other factors on the prevalence of intestinal parasites in pre-school children in the area under study, (c) studying the relationship between parasitic infection and Hb level in infected children and, (d) providing baseline data on intestinal parasites to assist decision-makers with planning for the prevention of environmental health diseases especially parasitic infection in the area.

# Chapter two

## Subjects, Materials and Methods

### 2.1 Characteristics of the study area

Al-Jiftlik village is located in the northern part of the Jordan Valley, 35 km east of Nablus City, with population of 3177 (1582) male, (1595) female. An additional number of 2500 people reside in the village during the winter where they work in agriculture (Palestinian Central Bureau of Statistics, 1999).

Al- Jiftlik area is located between Jordan River and the eastern slopes of the central mountains of the West Bank with an elevation of 349-m below sea level to 100 m above sea level (Figure 2.1). The area is characterized by a very hot dry summer and mild rainy winter. The maximum average temperature during January (coldest month) and August (hottest month) are 19 °C and 39 °C, respectively. The mean annual rainfall for the period 1968-1996 was 166 mm (ARIJ, 1996).

encouraged a relaxed and trusting atmosphere during the interviews. The health workers were also usually able to confirm the accuracy of the answers given by the respondents

## 2.4 Collection of clinical specimens

Fresh stool specimens from pre-school children attending the medical lab in Al- Jiftlik health center were collected using standard procedures (Fleck & Moody, 1993).

1. Approximately 10-g samples of fresh stool, uncontaminated by urine or water was collected from each child, into a clean container using a wooden spatula.

**2.** The sample was labeled clearly with the child's name, number, date and time of collection.

**3.**The specimens were first examined macroscopically for parasitic worms, and then microscopically by direct wet mount in normal saline and by the concentration methods (Shetty & Prabhu, 1988).

### 2.4.1 The wet mount method

**1.** Approximately 2 mg of stool was emulsified in a drop of warm (37°C) saline on a clean slide using a wooden applicator and the resulted smear was stained with Lugol's iodine for identification of protozoan cysts.

**2.** A coverslip was applied onto the smear and the preparation was examined under the microscope with the condenser lowered and light intensity adjusted so that the opaque structure of the trophozoites and cysts can be seen.

**3.** The total area of the coverslip was scanned by using the X10, and X40 objectives as required, and finally the slides were discarded directly into disinfectant (dilute sodium hypochlorite solution containing 2000 ppm chlorine) overnight as they may contain infectious material.

### 2.4.2 Concentration method

**1.** Each specimen was emulsified in 7 ml of formaline in a centrifuge tube and centrifuged at 2000 rpm for three minutes.

**2.** The fatty plug and debris at the top of the tube was loosen by using an applicator stick and the tube was inverted quickly to discard the supernatant.

3. Few drops which remained with the deposit were mixed well and one drop was transferred to a microscope slide, covered with coverslip and stained with lugol's iodine

4. The whole coverslip was scanned by using X10 and X40 objectives for the identification of parasites (Fleck & Moody, 1993).

**2.5 Hemoglobin concentration determination**

Blood samples were taken from the surveyed pre-school children by using EDTA tube to estimate Hb level, by the cyanomet hemoglobin method (Patel, 1994) as follows:

1) Spectrophotometer (Spectronic 20 D) was standardized by international reference blood control for measurement of Hb in blood at the beginning of the test.
2) 5 ml of Drabkins solution was placed in a clean dry test tube.
3) 20μl of whole blood were transferred into Drabkins solution (dilution factor 1:200).
4) The contents of the tube were mixed well and then tube incubated at room temperature for 5 minutes.
5) The optical density (O.D) of the sample solution was measured against Drabkins solution at 540 nm.

6. Hemoglobin level was then calculated in g per dl as follows.

**Hb level = (O.D of the sample) / (O.D of the standard) x (concentration of standard in g per dl / 1000) X (dilution factor - 200).**

**2.6 Data analysis** hi-square and fisher's tests were used to detect significant associations using (SPSS version 8.0) .The study population was classified into four groups.<1years, 1-2 years, 3-4 years, 5-6 years .The level of significance used was P= 0.05

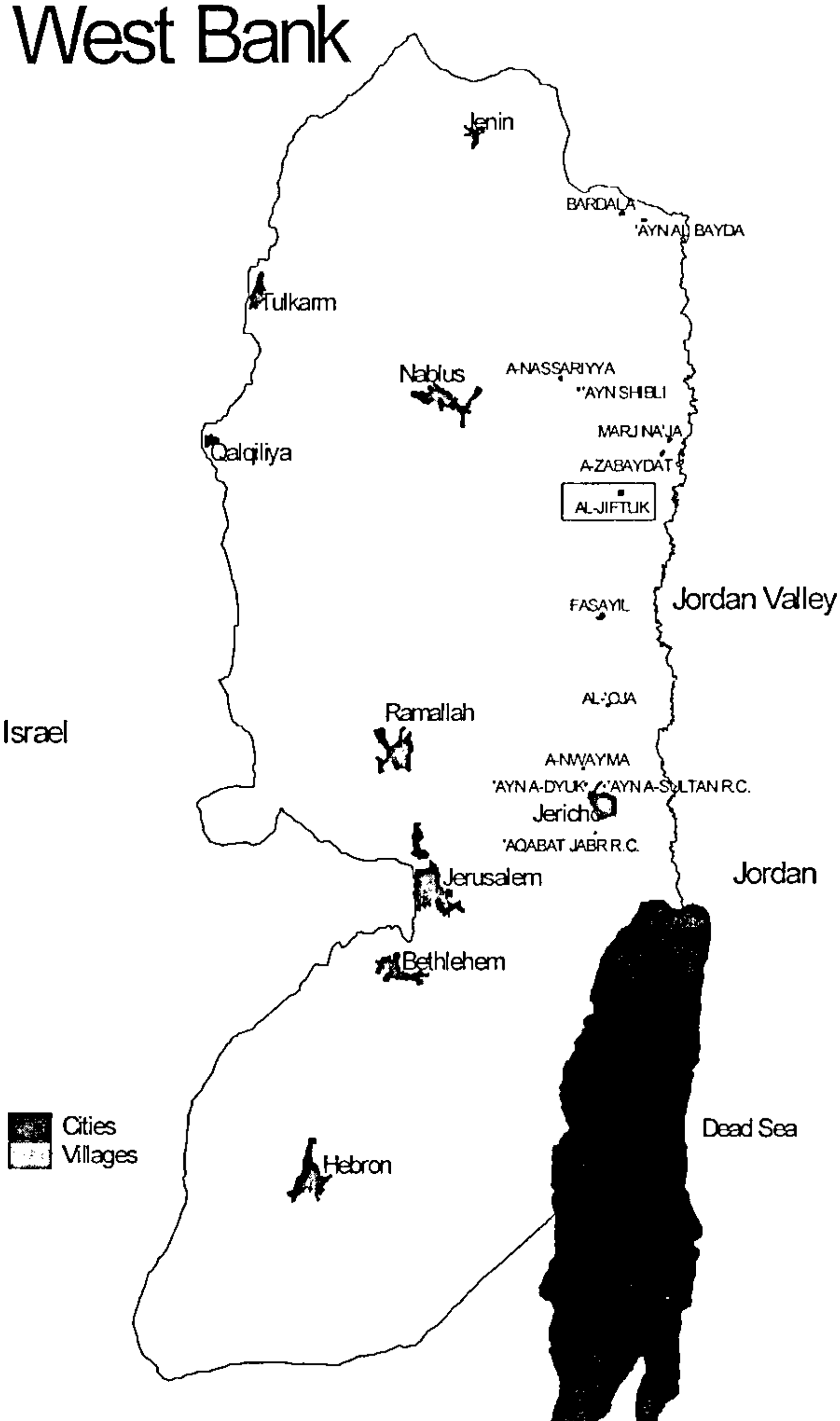
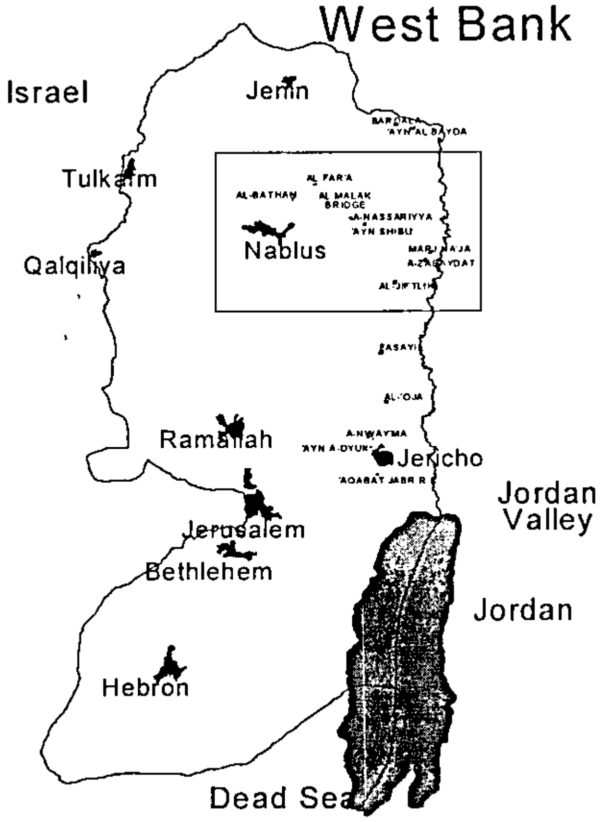



**Figure2.1 West Bank map including the study area (Al -Jiftlike village)**



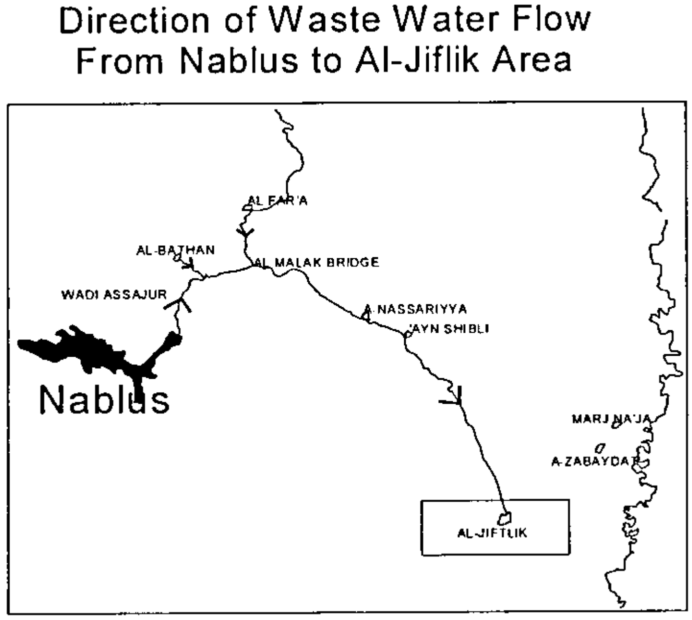




**Figure 2.1 Map of the West Bank, Including the Study Area (Al-Jiftlik)**

**Table 2.1 Distributions of Children by Age and Sex n=220**

| Age Group/ year | Male(%) | Female(%) | Total(%) |
|---|---|---|---|
| Less than 1 | 17 (14.7) | 18(17.3) | 35(15.9) |
| 1-2 | 21 (18.1) | 22 (21.2) | 43(19.5) |
| 3-4 | 37 (31.9) | 33(31.7) | 70(31.8) |
| 5-6 | 41 (37.9) | 31(29.8) | 72(32.8) |
| Total | 116 (52.7) | 104(47.3) | 220(100) |

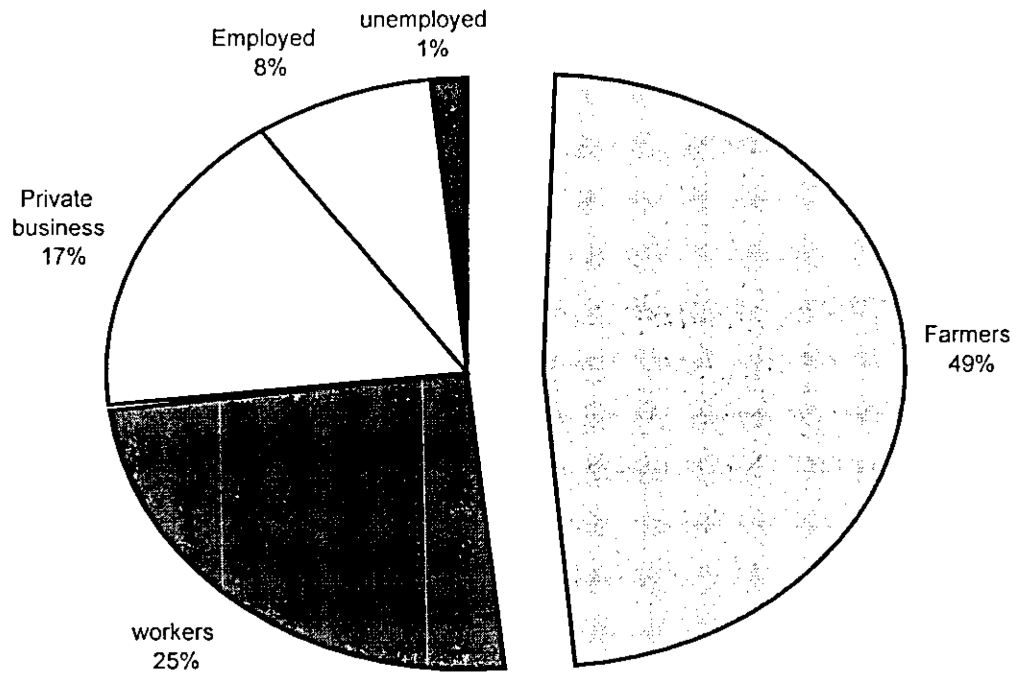



**Figure 2.2 Distribution of children by father's occupation**

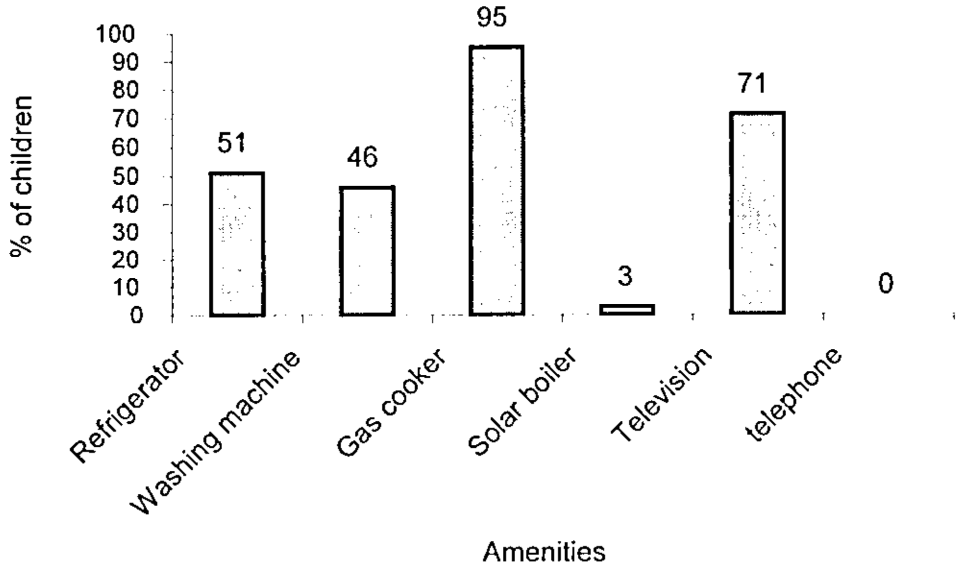



**Figure 2.3 Distribution of children by presence of home amenities**

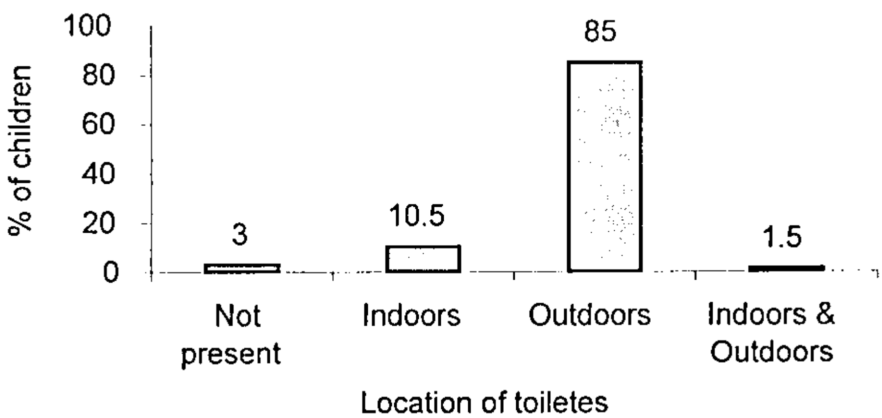



**Figure 2.4 Distribution of children by presence of toilet**

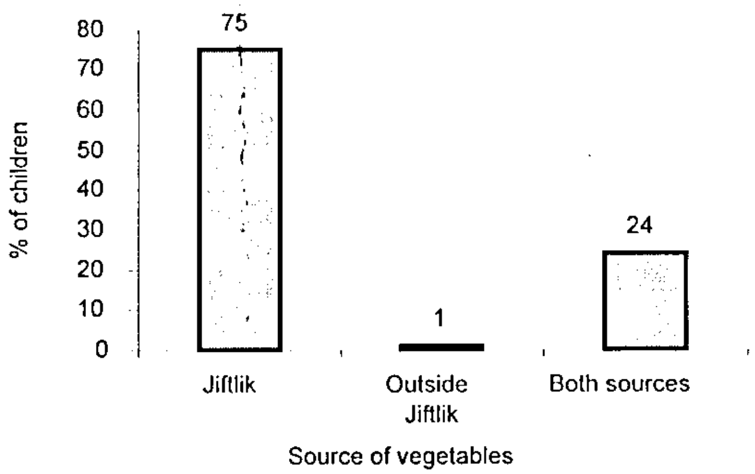



**Figure 2.5 Distribution of children by source of vegetables**

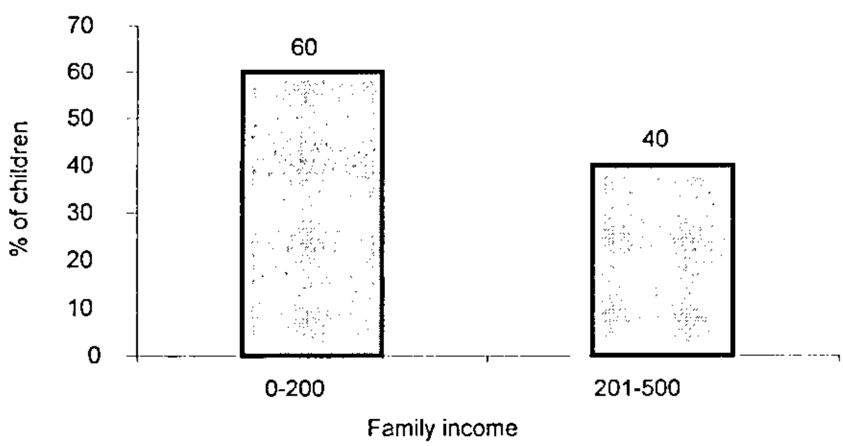



**Figure 2.6 Distribution of children by monthly family income (Jordanian Dinars)**

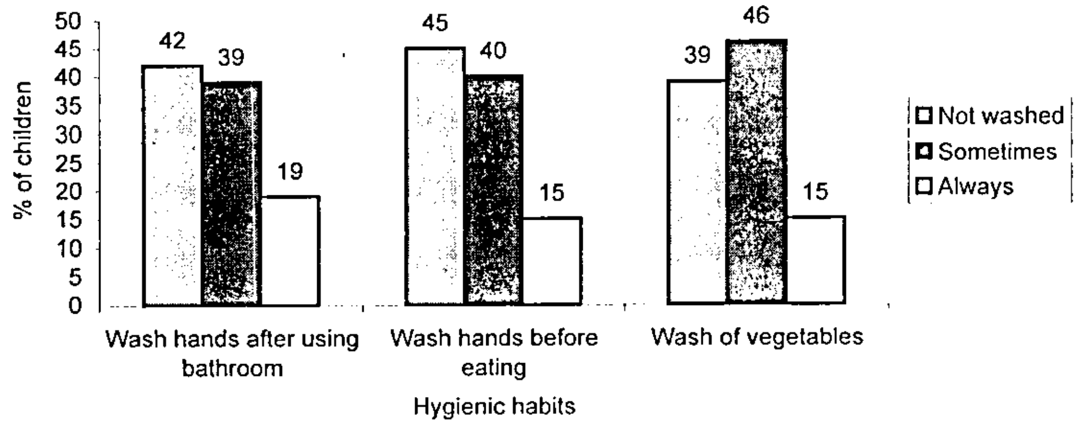



**Figure 2.7 Distribution of children by practice of hygienic habits.**

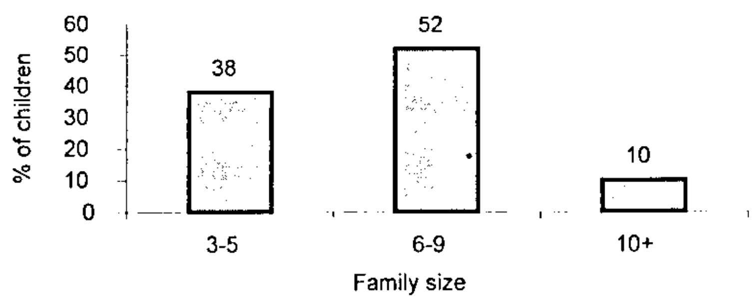



**Figure 2.8 Distribution of children by family size**

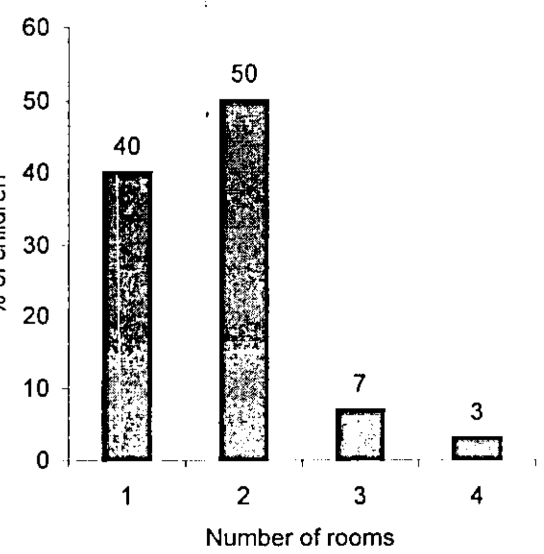



**Figure 2.9 Distribution of children by number of rooms**

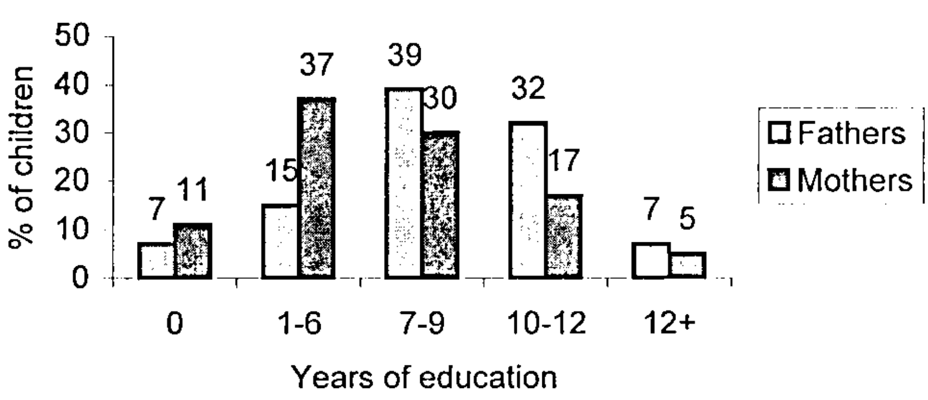



**Figure 2.10 Distribution of children by fathers and mothers years education**

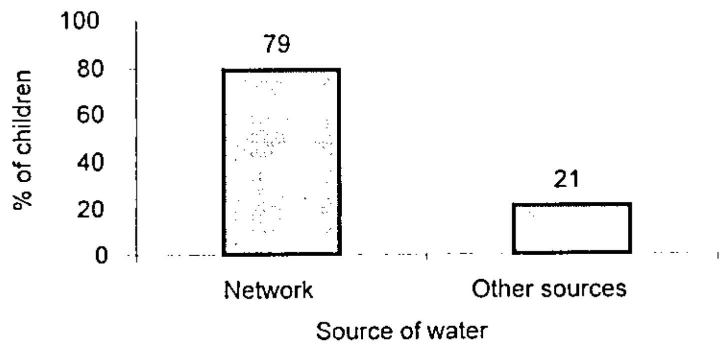



**Figure 2.11 Distribution of children according to source of drinking water**

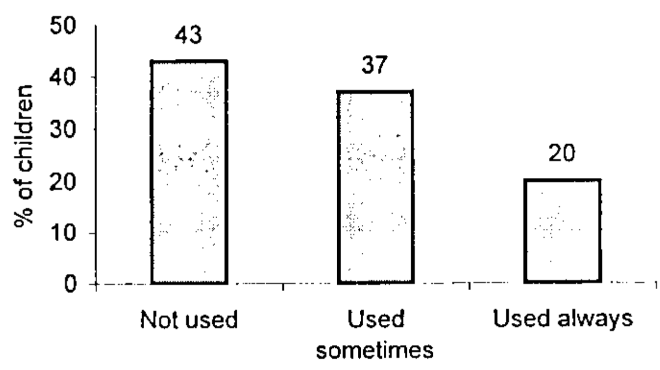



**Figure 2.12 Distribution of children by use of toilet**

# CHAPTER THREE

# RESULTS

# Chapter three

## Results

### 3.1 Prevalence and distribution of intestinal parasites

Data on the prevalence and distribution of intestinal parasites in pre-school children of Al-Jiftlik area are presented in (Tables 3.1-3.15). About 45.5% (100) of the children surveyed (220), were found in this study to be infected with intestinal parasites (Table 3.1). Most common parasites encountered were *Giardia lamblia* (20%), followed by *Entamoeba histolytica* (14.5%).

**Table 3.1 Distribution of intestinal parasites in pre school children in Al-Jiftlik village according to sex. (Number of examined children=220)**

| Types of parasitic infection | Number of infected children | | | Prevalence rate (%) |
|---|---|---|---|---|
| | Male | Female | Total = % | |
| *Giardia lamblia* | 21 | 23 | 44 | 20.0 |
| *Entamoeba histolytica* | 16 | 16 | 32 | 14.5 |
| *E. histolytica & G. lamblia* | 8 | 6 | 14 | 6.4 |
| *Enterobius vermicularis* | 1 | 3 | 4 | 1.8 |
| *Hymenolepis nana* | 2 | 2 | 4 | 1.8 |
| *Others* | 0 | 2 | 2 | 0.9 |
| *Total* | 48 | 52 | 100 | 45.5 |

The surveyed children were divided into four age groups, (Table 3.2) .Of the 220 children examined 116 (52.7%) were males and 104 (47.3%) were females، 41.4% of the males (48males) and 50% of the females (52 females) were infected with at least one type of intestinal parasites.

The prevalence of intestinal parasites in relation to age and sex is shown in Table 3.2. Higher prevalence rates were found in males aged 5-6 years (51.2%), and in females aged 3-4 years (60.6%) than in other age groups. The highest prevalence rate among all infected children was found in the 5-6 years (54.2%).

**Table3.2 Distribution of intestinal parasitic infection among children according to age and sex**

| Age group (years) | Number of males examined | Infected males(%) | Number of females examined | Infected female (%) | Total(%) |
|---|---|---|---|---|---|
| <1 | 17 | 2 (11.8) | 18 | 2 (11.1) | 4(11.4) |
| 1-2 | 21 | 8 (47.6) | 22 | 12(54.5) | 20(46.5) |
| 3-4 | 37 | 17 (45.9) | 33 | 20(60.6) | 37(52.8) |
| 5-6 | 41 | 21(51.2) | 31 | 18(58.0) | 39(54.2) |
| Total | 116 | 48(41.4) | 104 | 52(50.0) | 100(45.5) |

The prevalence rate of intestinal parasites was found to be considerably higher in children who did not use toilets (57 out 95 children, 60%) than in children who claimed to always use toilets( 8 out 44, 18.2%) . (Table 3.3)

($\chi^2$=31.430, $df$=2, $p< 0.05$)

**Table3.3 Distribution of infected children by use of toilets. n=220**

| Use of toilet | Number of examined children | Number of infected children(%) |
|---|---|---|
| Used always | 44 | 8(18.2) |
| Used sometimes | 81 | 35(43.2) |
| Not used | 95 | 57(60) |
| Totals | 220 | 100(45.5) |

Higher prevalence rates of parasitic infections among children were also found to be associated with families with lower income (e.g. farmers) or lower education level, than with families with higher income or higher education levels (Tables 3.4-3.7).

**Table3.4 Distribution of cases by father's occupation.**

| Father's occupation | Number of examined children | Number of cases(%) |
|---|---|---|
| Farmers | 107 | 56(52.4) |
| Employed | 18 | 8(44.4) |
| Private business (Traders) | 38 | 16 (42) |
| Unemployed | 3 | 1(33) |
| Workers | 54 | 17(31.5) |
| Totals | 220 | 100(45.5) |

($\chi^2$ =1.678, df= 4, p<0.05)

**Table 3.5 Distribution of cases by monthly family average income( in Jordanian dinars,JD)**

| Average monthly income | Number of examined children | Number of cases (%) |
|---|---|---|
| 0-200 | 131 | 61 (46.6) |
| 201-500 | 89 | 39 (43.8) |
| Totals | 220 | 100 (45.5) |

($\chi^2$= 2.401, df 1, p<0.05)

**Table3.6 Distribution of cases by Mother's education years.**

| Education level | Number of examined children | Number of cases(%) |
|---|---|---|
| 0 | 24 | 19(79) |
| 1-6 | 81 | 42(51.9) |
| 7-9 | 66 | 29(44) |
| 10-12 | 37 | 9(44.3) |
| 12+ | 12 | 1(8.3) |
| Totals | 220 | 100(45.5) |

($\chi^2$= 9.433, df= 4, p< 0.05)

**Table3.7 Distribution of cases according to father's years of education**

| Education level | Number of examined children | Number of cases(%) |
|---|---|---|
| 0 | 15 | 10(66.7) |
| 1-6 | 34 | 19(55.9) |
| 7-9 | 85 | 39(45.9) |
| 10-12 | 70 | 25(35.7) |
| 12+ | 16 | 7(43.8) |
| Totals | 220 | 100(45.5) |

($\chi^2$=3.788, df = 4, p>0.05)

No clear association was detected between the sources of drinking water and numbers of intestinal parasitic infections encountered in this study ($\chi^2$ = 2.009, df= 1, p<0.05). (Table3. 8).

**Table 3.8 Distribution of cases by source of drinking water**

| Source of water | Number of examined children | Number of cases (%) |
|---|---|---|
| Water network | 173 | 80 (46.2) |
| Other sources (Tanks, streams) | 47 | 20 (42.6) |
| Totals | 220 | 100 (45.5) |

Higher numbers of intestinal parasitic infections were found to be associated with poor hygienic habits.(Table 3.9 )

**Table3.9 Distribution of intestinal parasites by claimed children hygienic habits.**

| Hygienic habit | Number of children surveyed | Number of cases (%) |
|---|---|---|
| Wash hands after using bathroom | | |
| No | 92 | 59(64) |
| Sometimes | 86 | 36(41.9) |
| Always | 42 | 5(11.9) |
| Wash hands before eating | | |
| No | 100 | 67(67) |
| Sometimes | 87 | 29(33.3) |
| Always | 33 | 4(12) |
| Wash of vegetables | | |
| No | 85 | 61(72) |
| Sometimes | 102 | 37(36.2) |
| Always | 33 | 2 (6) |

**Table 3.10 Results of Chi –square test carried out on hygienic habit data (Table 3.9).**

| Statistical test | Wash hands after using bathroom | Wash hands before eating | Wash of vegetables |
|---|---|---|---|
| Chi –square | 20.327 | 34.427 | 43.355 |
| DF | 2 | 2 | 2 |
| P value | < 0.05 | < 0.05 | < 0.05 |

Generally higher prevalence rates of intestinal parasitic infection were found to be associated with crowding index (Table 3.11). ($X^2$=0.094,df= 1, p<0.05)

**Table 3.11 Distribution of intestinal parasites among children by the crowding index**

| Crowding. Index | Number of examined children | Number of cases |
|---|---|---|
| 1-3 | 201 | 93(46.3%) |
| >3 | 19 | 7(36.8%) |
| Total | 220 | 100(45.5%) |

Clear association was detected between family size and number of infected children (Table3.12). Statistically this association not reached significant level, ($\chi^2$ = 6.606, df =2, p >0.05)

**Table 3.12 Distribution of intestinal parasites among children by family size**

| Family size | Number of children surveyed | Number of infected children (%) |
|---|---|---|
| 3-5 | 84 | 28(33.3) |
| 6-9 | 114 | 59(51.8) |
| >10 | 22 | 13(59.0) |
| Total | 220 | 100(45.5) |

## 3.2 Relationship between parasitic infection and Hb level in children.

42.3% of the surveyed children were anemic (Hb concentration <11 g/dl). Highly statistical significant difference in prevalence of anemia was detected between infected and uninfected children ($\chi^2$ = 32. 385, df=1, P<0.001). (Table 3.13).

Mean hemoglobin concentration in healthy children surveyed was (11.49 g /dl) and the range of concentration varies from 9.8-to13 g/dl. Also the Mean hemoglobin concentration was significantly higher from that of children with parasitic infections and their Hb concentration varies from 9.00 to 12.6g/dl. (Tables 3.13 & 3.14)

**Tale 3.13 Association between intestinal parasitic infection and anemia in the surveyed children** ($\chi^2$ =32.385, df=1, p<0.001)

| Hb value | Number of examined children (%) | Number of infected children (%). | Healthy children (%) |
|---|---|---|---|
| <11 g/dl | 93 (42.3) | 67(72) | 26 (11.8) |
| >11 g/dl | 127(57.7) | 33(26) | 94 (42.7) |
| Total | 220 (100%) | | |

Significantly lower hemoglobin levels were found in children infected with two parasites (Table 3.14) than in children infected with one type of parasites. ($F= 62.261$, $df=2$, $p< 0.05$).

**Table 3.14 a Means of Hb level and types of parasitic infections**

| Types of infection | Number of Examined children | Means HB level ∓ SD |
|---|---|---|
| Free (no) | 120 | 11.49 ∓0.5973 |
| Single parasite | 84 | 10.81 ∓0.4894 |
| Double parasite | 14 | 10.30 ∓ 0.3033 |
| Total | 220 | 11.14 ∓0.6767 |

**Table 3.14 b Means of Hb level and types of parasitic infections**

| Types of parasitic infection | Number of infected children | Means Hb level ∓ SD |
|---|---|---|
| *G. lamblia* | 44 | 10.69 ∓ 0.6108 |
| *E. histolytica* | 32 | 10.85 ∓0.4501 |
| *G. lamblia & E.histolytica* | 14 | 10.49∓0.392 |
| *E. vermicularis* | 4 | 10.86∓0.2966 |
| *H. nana* | 4 | 11.00 ∓0.100 |
| *Others* | 2 | 10.75∓ 0.155 |
| *Totals* | 100 | 10.77∓0.5071 |

$F=2.585$ $df=5$, $P=0.042$

Mean Hb level of infected males is slightly higher than that of females. Statistically there is no significant association ($F = 0.157$, $df=1$, $p= 0.051$).

**Table 3.15 Mean Hb level in infected male and female children**

| Sex | Number of infected children | Means Hb level ∓ SD |
|---|---|---|
| Male | 48 | 10.8 ∓0.5399 |
| Female | 52 | 10.75 ∓ 0.5845 |
| Total | 100 | 10.77 ∓0.5630 |

# Chapter four

## Discussion

### 4.1 Prevalence of Intestinal Parasites

The present study demonstrates clearly that prevalence rate of intestinal parasitic infections among pre-school children in the Jordan valley (an area with subtropical climate) (45.5%), is higher than that reported for children in some other Arab countries e.g Saudi Arabia where a prevalence rate reaches (30.0%) (Abdel Hafeze *et al.*, 1986, Omar *et al.*, 1991).

However, *G. lamblia and E. histolytica* were the dominant intestinal parasites in both Jordan Valley and Saudi Arabia. These two parasites were also most prevalent in infected individuals in the Nablus area (Ali-Shtayeh *et al.,* 1989). However, prevalence results in this study can not be compared with those previously reported from the Nablus area, where study population targeted only individuals suspected of having intestinal parasitic infection.

The absence of hookworm and helminthic parasites (e.g *Ascaris, Strongyloids*) from children in the area under study, can be attributed to prevailing environmental conditions in the area which are inimical to the development and spread of these parasites (Yoeli *et al.*,1972). The time of year and geographical location are important factors in the interpretation of epidemiological data, since high temperature and humidity favor the development of intestinal protozoan parasites (Rinthaler *et al.,* 1988). Oyerinde, (1979) found 11.2% of 2825 stool specimens to be positive for *E. histolytica* in Lagos, noted that the rate of infection was highest at the end of rainy season. Precise further studies, are therefore, needed to define seasonal fluctuations in the incidence of parasitic infection.

Feachem *et al* (1983) proposed an environmental classification of excreted infections based on their epidemiological characteristics e.g (infective stage, rout of transmission etc..) of parasitic infection. Pathogens belonging to the categories related to this discussion are listed below (Table 4.1), and are categorized by latency, infective dose and persistence.

| Parasitic group | Parasitic infection | Transmission Focus |
|---|---|---|
| I Non- latent | Amoebiasis<br>Giardiasis<br>Hymenolepiasis | Personal |
| III Latent and Persistent<br>No Intermediate host | Ascariasis<br>Hookworm infection<br>Strogyloidiasis | Yard<br>Field<br><br>Crop |

* Feachem *et al* (1983)

All of the main parasites detected in this study belong to the non-latent category I, immediately infective upon excretions with low infective dose. No cases of category III (e.g. ascariasis, hookworms. Trichuriasis and Strongyloidiasis) were detected. The main difference between these two categories of infections is that category III infections require a specified period of incubation outside the host after excretion, whereas category I infections do not. Category II comprises bacterial infections, which were not determined in this study.

Only parasites of group I, were detected in this study whereas parasites of group III, were absent due to the fact that this category contains the soil-transmitted helminthes which are both latent and persistent. Their transmission has little or nothing to do with personal cleanliness because their eggs are not immediately infective to man. Any kind of latrine (toilet) that contains or removes excreta and does not permit contamination of the floor, yard, and field, will therefore limit transmission (Sinniah, 1984).

Human Excreta is not reused in agriculture in Al-Jiftlik village so this potential route of transmission does not represent a risk. It is possible that two additional factors are related to the absence of soil-transmitted helminthes infections. The high temperature and the low population density in the area. The low housing density and accompanying absence of shade, together with daytime temperatures, result in hot, dry topsoil, which may not be favorable for the survival of soil- transmitted helminthes eggs (Feachem *et al.*, 1983; Kan & Poon , 1987).

Villages in the high lands and specifically the ones in the south of the West Bank and also Gaza Strip have been found to have ascariasis and hookworms. These are mainly agricultural communities and have much lower temperature and more humid weather than those in Jordan Valley. They are also known to use human excreta in agriculture though not extensively (Union of Palestinian medical relief committees & Berzeit University, 1988).

Al-jiftlik village is considered an agricultural area, where most of the populations (75%) depend on their crops and vegetables as source of food.

The highest prevalence of parasitic infections (52.4%) was found in children of farmers followed by employees and traders (44.4%), and (42%), respectively.

The weak association between father's occupations and prevalence of parasitic infection can be explained by the fact that, regardless of main profession most village inhabitants work in agriculture and are therefore often exposed to intestinal parasitic infections.

The prevalence of parasitic infection increased with age, this may be related to longer exposure periods to the environment beyond the vicinity of the house which children experience with age (Table 3.2). In the present study however no marked differences in the prevalence of intestinal parasites were found among the different age groups and different sexes.

Amoebiasis and giardiasis have been encountered in children under 2 years of age (Merritt *et al.*, 1982; Gilman *et al.*, 1985), but in only one study have intestinal protozoan been found in the first weeks of life (Melvin & Mata, 1971). It seems that the children at Al-Jiftlik area pick up parasitic infections quite early in life. The youngest subject examined in the present study was a 9- month old baby hence, at 8 month of age infant gradually start sharing the family foods and become increasingly exposed to infection (Develoux *et al.*, 1990; Shetty *et al.*,1990).

Female children seem to be more at risk in contracting the disease than male children. Although females have higher prevalence rate of parasitic infection (50%) than males (41.4%), it would not be expected that there would be any significant difference between infected males and females of those ages. Young children irrespective of gender are similarly exposed to the environment, since social codes concerning the movement of female children outside the proximity of the house are not applied until children reach school age. Other studies have suggested that social restrictions on the movement of female children may account for lower infection levels in older children than it may be with younger children (Giacaman, 1985).

Higher prevalence of single parasitic infections than double infections were encountered among children in Al-Jiftlik area, whereas no cases of triple infection were detected. The present study showed that the presence of one or more intestinal parasites was dependent on the presence of other parasites. This may be explained by the little variation in the environmental conditions where it is known from literature that all types of protozoan infection detected in the study have the same Fecal – Orals rout of transmission.( Feachem *et al.*, 1984 ;WHO, 1988).

**4.2 Effect of socio-economic conditions and environmen-tal variables on the children of study area.**

The Jordan Valley area comprises the smallest district in the West Bank both in terms of number of communities and population size. Its communities range between 200 and 3200 inhabitants, Hence Al-Jiftlik village is considered the largest village in Jordan valley, and it is probably the most underprivileged area in the West Bank both in terms of socioeconomic conditions and availability of basic services (Barghouthi & Diabes, 1992, 1993). However, no clear association was detected between the economic status index and child parasitism in the area. This may be related to the little differences in economic status and habitats of village children.

Untreated wastewater flows from the Nablus City is currently disposed into lands located in the west and east of the city. Two main waste-water streams are formed, one in the west (about 25 km long) and the other in the east (about 5km long) (Ali -Shtayeh *et al.,* 1989). The later wastewater stream mixes with Al- Far'a and Al-Bathan stream at Al-Malak Bridge. Farmers for irrigating various plants, especially vegetable and salad crops use the contaminated water. Vegetable and crops are thus become contaminated. Poor hygienic habits of children may also lead to contamination of hands, food and drinking water with protozoan cysts, and to infection through eating of unwashed vegetables and fruits (Dabri *et al.,* 1986) Hence, water contamination is considered as one of the risk factors of parasitic infection (Brown *etal.*,1985;Alakija, 1986; Christopher *et al.*,1987 Deborah , 1998).

Children in Al-Jiftlik may thus become infected after eating contaminated vegetables and food. People living in Al-Jiftlik area and other adjacent rural areas including Nablus City mainly consume agricultural products produced by farmers in the Jordan Valley. A gradual increases in the prevalence of intestinal parasitic infections (24.6% in 1981 to 37.8% in 1986) in the Nablus area was believed to coincide with the increase in the use of wastewater in irrigation. A health risk is obviously involved in the application of such wastewater to the land (Burge and Marsh 1978; Arne & Akaboug, 1986).

It was clear from this study that the increase in intestinal parasitic infection was mainly due to the increase in the prevalence of E. *histolytica* and *G. lamblia* (Table 3.1). These parasites are known to infect humans through polluted water, soil, vegetables, or other polluted food. Hence, comparing with other intestinal parasites the prevalence rate of amoebiasis and giardiasis is considered among the highest in the world ( AL-Mandi *et al.*, 1989; Ali- Shtayeh *et al*; WHO, 1992).

Regarding the environmental factors in Al-Jiftlik, the percentage of toilets outside the home is high (85%) and the toilets are not connected to a central disposal system. Davic *and Rit-* Chile,1948, pointed out that water borne transmission of Giardia was suggested as early as 1946 by an epidemyologic investigation of an outbreak of amoebiasis attributed to sewage contamination water supply in aTokyo apartment building .

Sewage contains microorganism derived from human and animal feces. The presence e of protozoan cysts and helminth eggs in waste-water is well- documented ( Burge & March, 1978; Olivier *et al.*, 1999). Hence protozoan cysts are directly infective, and helminth eggs are only infective after a period of maturation in the environment, except for *Enterobius vermicularis* (Table page 23) and *Hymenolepis nana* eggs which were encountered in this study (Gaspared & Wiart, 1994).

**4.3 Association between intestinal parasites and anemia**

A weak association between mean Hb value and the degree of parasitism among children was found in this study.

The relationship between anemia and intestinal parasitic infections has been for many years obscure. However, the effect of hookworm infection on anemia is well documented (Adedoyin *et al.*,1990; Sherchand *et al.*, 1996). Hence, the most serious consequence of hookworm infection is chronic blood loss from the small intestine leading to the development of iron deficiency anemia (Arekul, 1979). As mentioned earlier other researcher pointed out that although there is no doubt that hookworm infection is an important cause of anemia in school–age and adult population (Powlowski *et al.,* 1991), the contribution of hook worm infection to the etiology and severity of anemia in younger children of the pre-school age remains ill-defined. Furthermore, intestinal parasites are thought to cause loss of appetite, blood loss, decreased capacity for absorption of specific substances e.g (iron, vitamins, protein..etc) contributing to anemia ( Brasitus, 1979; Jammal & Ruebner ,1985; Adedoyin *et al.,*1990; UNECIF, 1992; Brooker. *et al.,* 1999)

Chronic asymptomatic intestinal protozoan infections, especially those caused by *E. histolytic,* in populations with already poor nutrition, may constitute an important hidden risk factor for iron deficiency anemia. (Weigel *et al.,* 1996). Individuals infected with protozoan are more likely to be subjected to primary malnutrition.

Interaction between nutrition and infection is thought to be a major contributor to morbidity and mortality worldwide. This interaction appears to be mutually aggravating where nutritional deficiencies impair various immune responses and thus could contribute to the development of infection. Infections interact with diet by affecting the appetite causing nutrient loss via diarrhea and vomiting, and impairing the absorption of nutrients from the intestinal tract. (Isliker & Schurch, 1979; Giacoman, 1985).

In this study a high prevalence of anemia (42.3%) was found in children at Al-jiftlik area, (Table3.13). However, a weak association between parasitic infection and presence of anemia in children was found.

## 4.4 CONCLUSIONS

1. Higher prevalence of intestinal parasitic infections among pre-school children of Al-Jiftlik than among children in other areas in West Bank was shown by this study. This may be attributed to wastewater irrigation in the study area, which resulted in the contamination of food, soil and water.

2. High prevalence of anemia (42.26%) was found among children in this study area.

3.Weak association was found in this study area between anemia and the prevalence of intestinal Parasites.

4. Further work is still needed to determine the prevalence Carrier State of intestinal parasitic infection in school children in Palestine and to assess its significance in the spread of infection and identify factors that affect this state.

## 4.5 RECOMMENDATION

1. More effort should be made to advise the farmers to stop using sewage water as a source of irrigating their vegetables.
2. Proper sewage system should be installed in the area.
3. Environmental health education programs on the hazards of intestinal parasites and hygienic habits should be carried out as soon as possible to create awareness of the problem among children
4. Domestic waste water generated in nearby Nablus should be treated properly before it is allowed to flow in the Wadis leading to Al-Bathan
5. Nutritional survey should be carried out in the village.

# References


Aalakija, W. (1986) Prevalence of intestinal parasitic disease agents in stools of people in arural area of Nigeria. *Annals of Tropical Medicine and Parasitology* ***80***, 545-547.

Abdel-Hafeze, M .M .A., El-Kady, N., Bolbol, A.S.& Baknina, M.H. (1986) prevalence of intestinal parasitic infections in Riyadh district, Soudia Arabia. *Annals of tropical medicine and parasitology* **80**, 631-634.

Adedoyin, M.A., Awogun, I. A. & Juergensen, T.(1990). Prevalence of intestinal parasitosis in relationship to diarrhea among children in Ilorin. *West African Journal of Medicine* **9**, 83-88.

Ali-Shtayeh, M. S., Hamdan, A-H.Y., Shaheen, S.F., Abu-Zeid, I. & Faidy, Y.R. (1989) Prevalence and seasonal fluctuation of intestinal parasitic infection in the Nablus area, West Bank of Jordan. *Annals of tropical medicine and parasitology* **80**, 631-634

Al-Mandi, A. A., Omar M.S., Abu-Zeid A.A.& Abdulla S.A. (1989) Intestinal parasites in urban and Rural communities of Abha, Saudi Arabia. *Annals of Saudi Medicine* **9**,182-186

Applied Research Institute (ARIJ). (1995) *Environmental Profile for the West Bank*. Nablus and Jordan Valley District: Bethlehem.

Arekul, S. (1979) The relationship between anemia and Hookworm infection. *Journal of the medical association of Thailand* **62**,378-38.

Arene, F.O. I. & Akabogu O. A. (1986) Intestinal parasitic infections in preschool children in the Niger Delta. *Journal of hygiene, Epidemiology, Microbiology & immunology* **30**, 99-102.

Barghouthi, M. & Daibes, I. (1993) *Infrastructure and health services in the West Bank.* Guidelines for health care planning, Ramallah: HDIP.

Barghouthi, M.& Diabes, I. (1992) *the West Bank rural PHC survey,* interim report **4**. Nablus and the Jordan valley, Ramallah: HDIP.

Brasitus, T. A. (1979) Parasites and malabsorption, *The American Journal of medicine 67,* 1058-1065

Brooker, S., Peshu, N., Warn, P.A., Mosobo, M., Guyatt, H.I., Marsh, K. & Snow, R.H. (1999) The Epidemiology of hookworm infection and its contribution to anemia among pre-school children on the Kenyan coast. *Transaction of the royal society of tropical medicine and hygiene* ***93,*** 240-246

Brown,K.H. Visveswara,G.S., Mondal.,G., Greensburg, Sack,R.B., Brand, F.& Khan, M.U. (1985) *Epidemiology and serology of Giardia* **80,** 545-547

Burge, W.D. & Marsh, P.B. (1978) Infectious disease hazards of landspreading sewage waters. *Journal of Environmental Quality* 7,1-7.

Christopher, G. C., Ropert, S & John, .A. B. (1987) Risk factors for endemic Giardiasis. *American Journal of public health* **177**, 585-587.

Dabri, F., Yohanan, W., Michael, D.& Hillel, I.S. (1986) Health risks associated with waste water irrigation, an epidemiological study. *American Journal of Public Health* **76,** 977-979.

Davic, C. & Rit chiel, S. (1948) Clinical manifestation and treatment of epidemic ameabiasis occurring in occupants of Mantestu department building- Tokyo- Japan, *American Journal of tropical medicine* 28,817-823.

Deborah, A. (1998) *Surveillance for water borne disease out breaks*- United States.(1995-1996), 1-34.

Develoux, M., Alarou, A. & Mouchet, F. (1990) High prevalence of giardiasis in an urban population in Niger. *Journal of tropical medicine and hygiene* ***93***, 355-356.

Diamond, L.S., Harlow, D.R., Kiestler, D. B., (1978) Entamoeba histolytica: *Iron & nutritional immunology*, second edition .

Egger, R. J., Hofhuis, E.H., Bloem, MW., Chusilp, K., Wedel, M., Intarakhao, C., Saowakontha, S., Schreurs, W. (1990) *Associations between intestinal parasitosis and nutritional status in 3-8 year old children in northeast Thailand* **42**, 212-223.

Feachem, R.G. (1984) Investigations for the control of diarrhoeal *diseases among young children:* promotion of personal and domestic hygiene. *Bulletin of the WHO*, 63, 467-589.

Feachem, R.G., Bradley, D., Garelik, H. & Mara, D. (1978) Sanitation and disease: *Health aspect Excreta and waste management.* Chichester: John Wiley And sons.

Fleck, S.L & Moody, A. H. (1993) *Diagnostic techniques in Medical parasitology*: Cambridge University press.

Gagandeep, K., Mary, S. M, Prasanna, D.R., Jasper, D. D Minnie, M. M. & Muliyil, J.P. (1999) prevalence of intestinal parasites in rural southern Indians. *Tropical medicine and international health* **3,** 74-75

Gaspard, P.G., Wiart, J. (1994) Experimental study of the helminth eggs adhesion, analysis of the environmental implications, *European Journal of Science* **4,** 367-376.

Gassmann, L. Sehwartzbrod, J. (1991) Wastewater and Giardia cysts. *Water Scientific Technology* **24,** 183-186

Giacaman, R. (1985) a *profile of life and health in three Palestinian* villages, Birzeit University, community health unit.

Gilman, R.H., Brown, K. H., Visveswara, G. S., Mondal, G., Greenburg, B., Sack, R. B., Brandt, F. & Khan, M. U. (1985) Epidemiology and serology of Giardia lamblia in a developing country. *Transactions of the Royal Society of tropical Medicine and Hygiene* **79,** 469-473.

Gupta, M.C. (1980) Intestinal parasitic infections and nutrition, *Indian Journal of pediatrics* **47,** 503-509.

Ilardi, I. Shiddo, S.C., Mohamed, H.H. (1987) The Prevalence and intensity of intestinal parasites in two Somalian communities. *Transactions of the royal society of Tropical Medicine and hygiene* **81**,336-339.

Islikar, H. & Schurch, B. (1980) *The impact of malnutrition on immune defense in parasitic infestation*. Vienna: Hons Huber.

Jammal, M.A., Cox, K., & Ruebner, B. (1985).Amoebiasis presenting as rectal bleeding without diarrhea in childhood *American Journal Pediatrics Gastronenterol Nutrition* ***4**, 294-299.*

Jeffery, G. M.(1960) A thre –year epidemyologic study of intestinal parasites in a selected group of mental patients. *American Journal of Hygiene* **71,** 14-19.

John, F.L., Valrie, A.L., Mariana, K.B., & Carol, J.P. (1998) Epidemiology of Giardiasis and cryptosporidiosis in Jamaica. *American Journal Tropical Medicine and hygiene* **59**,717-721.

Kan, S.P. & Poon, G.K. (1987) Prevalence, distribution and intensity of soil transmitted Helminthiasis among Malaysian children. *journal of Malaysian society of Public health* **101**,243-251.

Kaspari, S. & Gondie, A. (1986) *intestinal parasitic infection of refugee children in selected West Bank localities*, Birzeit University, community health unit.

Knight, R. (1980) Epidemiology and transmission of Giardiasis. *Transa ··-ns of the Royal society of Tropical Medicine and Hygiene*

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Omar, M .S., AL- Awad, M.E. & AL-Madani, A. (1991) Giardiasis and Amoebiasis infections in three Saudi closed communities. *Transactions of the Royal society of Tropical Medicine and hygiene* **94,** 57-60 .

Oyerinde, J.P.O., (1979) The Epidemiology of Entameba histolytica in a Nigerian urban population. *International Journal of Epidemiology* **8,** 55-59.

Oyerinde, J.P.O., Ogunbi, O. & Along, A. A. (1977) Age and sex distribution of infections with Entameba histolytica and Giardia intestinalis in the Lagos population. *International journal of Epidemiology* **6,** 231-234.

Palestinian Central of Statistics. (1999) *Population housing and establishment cencsus, 1997,* cencsus final results. Jericho Governorate: Ramallah-Palestine.

Pattle, A.H. (1994) *A manual of medical laboratory technology,* second edition Navaneet Ltd Bombay India

*Powlowski, Z. S.Schad, G.A. & Stott, G.I. (1991) Hookworm and anemia Approaches to prevention and control,* WHO , Geneva.

Ramdath, D .D., Simeon, D.T., Wong, M.S. &. Grantham-McGregor, S.M. (1995) Iron status of schoolchildren with varying intensities of Trichuris trichiura infection . *Annals of tropical medicine and parasitology* **110**, 347-351

Ravdin, J. I Petri, W.A. (1990) *Entameba histolytica (amoebiasis). Practice of infectious disease* ,New York: Churchill Livingstone.

Reinthaler, F.F. F., Mascher, Klem, G. & Sixl, W. (1988) Survey of gastrointestinal Parasites in Ogun State, southwest Nigeria. *Annals of Tropical Medicine and parasitology* **82,** 181-184.

Richard, A.O., Efrain, S.G., Guerrero, M. L F., Margarita, S., Doris, M., Nora, C., Gertrude, I. & Robertson, M. (1998) Correlation between intestinal parasitosis, physical growth, and psychomotor development among infants and children from rural Nicaragua. *American Journal of tropical medicine and hygiene* ***58,**470-475.*

Roche, J.& Benito, A. (1999) Prevalence of intestinal parasite infections with special reference to Entameba histolytica on the island of Bioko (Equatorial Guinea). *American Society of Tropical Medicine and hygiene* **60**, 257-262.

Sepulveda, B & Martinez, W. (1984) *Tropical and geographical medicine*, New York: McGraw-Hill.

Sherchand, J.B., Larsson, S. & Shrestha, M.P. (1996) Intestinal parasites in children and adults with and without abdominal discomfort from the Kathmandu area of Nepal. *Tropical Gastroenterology* **17**, 15-22.

Shetty, N. & Prabhu, T. (1988) Evaluation of fecal preservation and staining methods in the diagnosis of acute amoebiasis and giardiasis. *Journal of clinical pathology* **41**,694- 699

Shetty, N., Narasimha, M., Raghuveer, T. S., Elliott, E., Farthing, M.J.G. & Macaden, R. (1990) Intestinal amoebiasis and giardiasis in southern indian infants and children. *Transactions of the royal society of Tropical Medicine and Hygiene* **84**,382-384.

Siddiqui, M .A. (1981) The Prevalence of human intestinal Parasites in AL-Baha, Saudi Arabia: A preliminary survey. *Annals of Tropical mediçine and Parasitology* **75**, *565-566.*

Sinniah,.B.(1984)Epidemiological studyof soil transmitted lminthes in Malaysia. Journal *of Malaysian* society of health **4**,1-4

Unicef, program document, (1992) *Anemia control and growth.* Monitoring appraisal West Bank and Gaza strip.

Union of Palestinian medical relief committees and Birzeit University, Community health unit. (1988) *Ain Al- Dyuk village, health study.* Unpublished report.

Utzinger, E.K., Goran, H.P.Marti, Tanner, M. & Lengeler, C. (1999) Intestinal amoebiasis, giardiasis and geohelminthiasis: Their association with other intestinal parasites and reported intestinal symptoms. *Transactions of the Royal society of Tropical Medicine and hygiene* **93**, 137-141

Walker, S. P., Robinson, R. D., Powell, C.A. & Grantham-McGregor S. M . (1992) Stunting intestinal parasitism and the home environment. . *Transaction Royal Society of Tropical Medicine and Hygiene, 86,313*-332.

Weigel, M. M.,Calle, A., Armijos, R.X., Vega, I. P., Bayes, B.V. &Montenegro, C.E. (1996) The effect of chronic intestinal parasitic infection on maternal and prenatal outcomes. *international journal of gynecology and obstetrics* ***52***,9-17.

World Health Organization, (1983) *Drinking water quality control in small community supplies*, Guidelines for drinking water quality **3** WHO , Geneva

World Health Organization statistics. (1986) Disease prevention & control **39**, Geneva.

World Health Organization statistics. (1992) communicable disease, Epidemiology & control **45**, Geneva

World Health Organization. (1987) *Prevention and control of intestinal parasitic infections.* Technical report series, Expert Committee, Geneva

World Health Organization. (1981) *Field studies on the relation between intestinal parasitic infections and human nutrition.* Document Nut. /81.3 PDP/82.4, Geneva.

World Health Organization. (1981a) *Intestinal Protozoan and helminthic infections* .WHO Technical Report series No. 666, Geneva.

World health organization. (1985) *General strategies for Preventing and Control of intestinal parasitic infection with primary health care,(PHC)* .informal PDP document PDP/85.1,Geneva.

World Health Organization. (1988) *Prevention and control of intestinal parasitic infection.* Report of WHO expert committee, Geneva

*World Health Organization statistics.* (1993) The scientific journal of WHO (Bulietin) **71**, 1-134. Geneva.

Wright, R.A.Spenger, H.C. Brodsky, E.E. & Vernon , T.M.(1997) Giardiasis in Colorado . an epidemiological study. *A mercian journal of Epidemiology* **105,** 330-336.

Yoeli, M. Most, H. Hamoond, J.& Scheinesson, G.P.(1972) Parasitic infections in a closed community results of a 10 –year survey in Willowbrook state school. *Transactions of the Royal Society of Tropical Medicine and Hygiene* ***66***,746-751

# Appendix
## Part one:
## Household Questionnaire

**Identifying Information:**
Household No.: _ _ _

Questionnaire Serial No.: _ _ _

Name of Head of Household: ______________________________

Interview date : _ _ / _ _ / 1 9 _ _
dd mm yy

**Section 1: Household Demographic Information:**

1A: Size of family: _ _

1B. No. of rooms in the house: _ _
(Excluding kitchen and bathrooms)

1C: Number of children in the age group less than 6 years old: _ _

**Section 2: Household Socioeconomic Information:**

2A. Do you have the following items at home?

| | | |
|---|---|---|
| 1. Refrigerator: | 0- Absent | 1- Present |
| 2. Washing Machine: | 0- Absent | 1- Present |
| 3. Solar boiler: | 0- Absent | 1- Present |
| 4. Gas Cooker: | 0- Absent | 1- Present |
| 5. Television: | 0- Absent | 1- Present |
| 6. Telephone: | 0- Absent | 1- Present |

2B. What's the total monthly average income for the household?
1. 0 - 200 JD
2. 201– 500 JD
3. 501 – 800 JD
4. More than 800 JD

**2C: Father:**

☐ 1. Number of years of education: _ _

☐ 2. Occupation:

1. unemployed
2. Private business
3. Employed
4. Farmer
5. Others, specify ____________

**2D. Mother:**

☐ 1. Number of years of education: _ _

☐ 2. Occupation:

1. House wife
2. Employed
3. Others, specify ____________

**Section 3: Hygienic Conditions:**

3A. Presence of toilets:

1. Not present
2. Present indoors
3. Present outdoors
4. Present inside & outside

3B: Source of drinking water:

1. Mekorot (network)
2. Tanks
3. Streams
4. Others, specify ______________________

3C: Source of Vegetables:

1. Jiftlik
2. Outside Jiftlik
3. Both sources

## Part two:
## Child Questionnaire

**Identifying Information:**

Household No.: _ _ _

Questionnaire Serial No.: _ _ _

Name of Head of Household: ______________________________

Interview date: _ _ / _ _ / 1 9 _ _
dd mm yy

**Section 1: Demographic Information:**

1A: Name of child: ______________________

1B: Birth date: _ _ / _ _ / 19 _ _
dd. mm yy

1C: Sex:

1.Male
2.Female

**Section 2: Hygienic Habits:**

2A: Use of toilet by the child:

1. Not used
2. Used Sometimes
3. Used always

2B: Does the child wash his/her hands after using bathroom?

1. No
2. Sometimes
3. Always

C: Does the child wash his/her hands before eating?

1. No
2. Sometimes
3. Always

2D: Does the child wash vegetables before eating them?

1. No
2. Sometimes
3. Always

2E: Was the child diagnosed with the following diseases?

| | | |
|---|---|---|
| 1. Thalasemia | 1- Yes | 0- No |
| 2. Leukemia | 1Yes | 0- No |
| 3. Hepatitis B | 1- Yes | 0- No |
| 4. Other blood diseases | 1- Yes | 0- No |

If yes, please specify, ____________________________________

| | | |
|---|---|---|
| 5. Chronic diseases | 1- Yes | 0- No |

If yes, specify chronic disease, ____________________________

2F: Did the child receive antihelminthic drugs during the last 3 months?

1- Yes
0- No

**Section 3: Laboratory tests results:**

3A: HB level: _ _ g/dL

3B: Parasitic infection:

1. E. histolytica
2. Giardia lamblia
3. Entrobias vermicularis
4. Hymenolypis nana
5. Others, specify __________________________

# دراسة وبائية الطفيليات المعوية في أطفال أعمارهم دون السادسة في منطقة الجفتلك – غور الأردن

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**الملخـص**

تمـت هـذه الدراسـة خلال الفترة الواقعة بين شهري كانون الثاني ١٩٩٨ وشباط ١٩٩٩ وهي دراسـة وبائيـة للطفيليات المعوية في أطفال أعمارهم دون السادسة وتأثير الطفيليات على مستوى هيموغـلوبين الـدم عندهم وذلك في منطقة الجفتلك في غور الأردن . شملت عينة الدراسة ٢٢٠ طفلا :١٠٤ انثى ، (٤٧,٣%) و ١١٦ ذكرا (٥٢,٧%).

أظهـرت الدراسـة ان ٤٥,٥% من الأطفال (١٠٠) طفل كانوا مصابين بنوع واحد على الأقل من الطفيليات المعوية ، وان اكثر هذه الطفيليات شيوعا هي على النحو التالي

*Giardia lamblia 20.0% Entamoeba histolytica 14.50% Giardia lamblia and Entamoeba histolytica 6.4% Entrobias vermicularis 1.8% and Hymeonlpis nana 1.8% and other types 0.9%.*

أظهرت النتائج آن معدل انتشار الإصابة بهذه الطفيليات كانت اقل لدى الأطفال الأصغر سنا ٤–٥سنوات (٤١,٢%) منها عند الأطفال الأكبر سنا (٥–٦) سنوا ت (٥٤,٢%) ، كما كانت نسبة الإصابة في الذكور (٤١,٤%) اقل منها نسبيا لدى الإناث (٥٠%).

وأظهـــر الـــبحث وجـــود ارتباط معنوي بين نسبة الإصابة لدى الأطفال والمستوى الاقتصادي - الاجـــتماعي والتعـــليمي لـــلعائلات التي يأتون منها مثل المزارعين وأطفال عائلات ذوي الدخل المرتفع ومستوى تعليمي أفضل .

كذلـــك أظهر البحث وجود ارتباط معنوي قوي بين حجم الآسرة ومعدل الإصابة، حيث ظهرت ٦٤ % من الإصابات في أطفال آتو من أسر كبيرة الحجم (٥أطفال فأكثر ).

وأظهـــرت نـــتائج الدراســـة أيضا أن معدل تركيز الهيموجلوبين عند الأطفال في هذه المنطقة كان ١١,١٤ غـــم /دل، وأن ٤٢,٢ % مـــن هؤلاء الأطفال كان مستوى تركيز الهيموجلوبين عندهم أقـــل مـــن ١١ غـــم/دل " الحد الأدنى من التركيز الطبيعي عند الأطفال في هذه العمر". وتبين من النتائج أيضا وجود ارتباط معنوي ضعيف بين فقر الدم والإصابة بالطفيليات المعوية .

تشير المعطيات في هده الدراسة بأن ارتفاع معدل انتشار الطفيليات المعوية عند الأطفال في منطقة الجفتلك يمكن آن يعزى الى الظروف الصحية والبيئة السيئة في المنطقة واعتماد المزارعين على المياه العادمة في ري مزروعاتهم.